The Exposure-dose-response Triad in the Georgia Basin: Synoptic Measures of External Chemical Exposure, Internal Chemical Dose, and Associated Biological Responses

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Abstract

Bioaccumulation is the ultimate link between environment and organism, and a necessary element for evaluating marine environmental quality and ecosystem health. Furthermore, monitoring and assessment programs need to establish links between water, sediment, and tissue chemistry with effects on organisms to provide meaningful results that can be used as the scientific basis for regulatory decisions on toxic loadings. The exposure-dose-response triad emphasizes the measurement of tissue chemistry and associated biological responses, incorporates components of laboratory testing and field monitoring, and adds elements of controlled field testing. This approach is consistent with ecological risk assessment paradigms that emphasize characterizing exposure and effects. Traditional approaches, such as the sediment quality triad, successfully identify whether contaminants are entering the system and if there is a measurable response, but they do not directly address whether contaminants are biologically available and whether these contaminants are causing the response. There is a disconnect between exposure, dose, and response in many Georgia Basin and Puget Sound monitoring programs designed to quantify the status and trends in ambient conditions. The purpose of this paper is to demonstrate a different approach for establishing those links by using bivalve monitoring and the tissue residue effects paradigm.